

Epizoic associates of the Bombay Spiny Lobster *Panulirus polyphagus* (Herbst)

BY

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(With one plate)

The lodgements of sedentary epizoa on such an unusual substratum as a lobster not only make interesting records but are often suggestive of the environment and the normal intermoult period of the host. Good and accurate descriptions of epizoic associates of the American lobster *Homarus americanus* (M. Edw.) are given by Herrick (1895, p. 121) and Dexter (1955, p. 160), and of the Norway lobster *Nephrops norvegicus* (L.) are given by Barnes & Bagenal (1951) and Andersen (1962, p. 307). Recently Dinamani & Kurian (1961) have published a note on pedunculate cirripeds infesting the spiny lobster *Puerulus sewelli* Ramadan collected off Kerala. However, no noteworthy account of the epizoa of commercially important Indo-Pacific spiny lobsters is available.

During the course of investigations on the biology of *Panulirus polyphagus* (Herbst) the author was able to examine more than 4000 specimens for the presence of any macroscopic epifauna. These spiny lobsters were caught in inshore waters (2-6 metres) and offshore waters (30-70 metres), in hoop nets and trawls respectively. The average weight of the spiny lobster having epizoa was 362 gm. and, except for the specimens specifically noted in Table I, the condition of the shell was hard. The carapace length was measured to the nearest 2.5 mm. from the antennular tergum to its posterior margin.

In contrast to *P. polyphagus*, which constitutes as much as 99% of the total spiny lobster population around Bombay (Chhappgar & Deshmukh 1961), the other species *P. dasyops* (H. Milne Edwards), *P. versicolor* (L.), and *P. ornatus* (Fabr.) whenever examined for any macroscopic epizoa were found to be negative, possibly due to the extremely small number available for examination. In the case of the squat-lobster *Thenus orientalis* (Lund), however, which also is found

TABLE I

PERCENTAGES OF *Panulirus polyphagus* FOUND ENCRUSTED WITH EPIZOA

Date	Depth, gear, and no. of specimens collected	Percentage of total catch	Epizoic species	Attachment site and abundance	Carapace length	Remarks
4-6-1960	50 metres, Trawl net, 3	3.19	{ <i>Serpulid</i> (tube-forming annelid) do. <i>Balanus amphitrite</i> }	{ Carapace (1250 sq. mm.) and Sternum (150 sq. mm.) Sternum (two tubes) Between the orbital spines (one) Carapace (four) Carapace (three) Left antenna (one) } Carapace (one) Carapace (two young) Carapace (19 young) Antennae (7 young) Carapace (one) }	{ 11.0 cm. 9.75 cm. 12.5 cm. 10.5 cm. 10.0 cm. 10.5 cm. 8.5 cm. 9.5 cm. 10.0 cm.	Newly moulted Newly moulted
25-7-1960	60 metres, Trawl net, 6	15.00	<i>Balanus amphitrite</i>	{ Carapace (one) Carapace (two) }	9.0 cm. 11.5 cm.	
31-8-1960	52 metres, Trawl net, 2	7.69	<i>Balanus amphitrite</i>	Sternum (two young)	7.5 cm.	
4-9-1960	6 metres, Hoop net, 1	2.44	<i>Ostrea cucullata</i>			

TABLE I (continued)

Date	Depth, gear, and no. of specimens collected	Percentage of total catch	Epizoic species	Attachment site and abundance	Carapace length	Remarks
23-9-1960	66 metres, Trawl net, 5	20.00	{ <i>Balanus amphitrite</i> <i>Ocrotasmsis warwickii</i> (Gray) <i>Balanus amphitrite</i> }	{ Carapace (three) Carapace (two) Carapace (four) First tergum (one) Carapace (six)	10.0 cm. 10.5 cm. 10.5 cm. 9.75 cm. 10.0 cm.	Plate, Fig. 2
18-11-1960	4 metres, Hoop net, 1	2.00	<i>Acanthodesia</i> (Encrusting bryozoan)	Carapace (375 sq. mm.)	11.0 cm.	
16-2-1961	40 metres, Trawl net, 1	2.04	<i>Balanus amphitrite</i>	Carapace (four)	10.0 cm.	
4-4-1961	50 metres, Trawl net, 2	5.00	<i>Balanus amphitrite</i>	{ Carapace (three) Carapace (five)	8.75 cm. 10.5 cm.	
11-4-1961	44 metres, Trawl net, 2	7.14	{ <i>Balanus</i> sp. <i>Balanus amphitrite</i> }	Sternum (one young) Carapace (three)	10.0 cm. 10.75 cm.	
23-4-1961	54 metres, Trawl net, 5	8.07	{ <i>Balanus amphitrite</i> <i>Balanophyllia</i> sp. (Coral), & <i>Balanus amphitrite</i> }	{ Carapace (three) Carapace (two) Second tergum (one) Carapace (one) Carapace (one each) Carapace (one each)	12.25 cm. 11.0 cm. 10.5 cm. 10.5 cm. 11.25 cm.	
17-5-1961	6 metres, Hoop net, 1	2.50	<i>Balanus amphitrite</i>	Sternum (three)	11.0 cm.	Plate, Fig. 1

26-6-1961	40 metres, Trawl net, 4	13.95	{ { <i>Balanus amphitrite</i> { { <i>Chelomibia patula</i> { <i>Balanus</i> sp.	{ Carapace (three) { Uropod (two) { Carapace (four) { Carapace (one) { Carapace (one) { Carapace (two, young)	10.0 cm. 9.5 cm. 10.75 cm. 11.75 cm.
	64 metres, Trawl net, 2	13.95	{ <i>Balanus amphitrite</i>	{ Carapace (two)	10.75 cm.
25-9-1961	4-6 metres, Hoop net, 1	3.03	{ <i>Ostrea (Crassostrea)</i> <i>cucullata</i>	{ Carapace (five young)	10.5 cm.
	48 metres, Trawl net, 3	11.11	{ <i>Balanus amphitrite</i> { <i>Octolasmis tridens</i> (Aurivillius) { <i>Balanus amphitrite</i>	{ Carapace (three) { Carapace (three) Carapace (five very small) Carapace (one)	9.25 cm. 11.0 cm. 9.75 cm.
1-2-1962	60 metres, Trawl net, 3	7.50	{ <i>Balanus amphitrite</i>	{ Carapace (four) { Carapace (one) { Carapace (two)	10.0 cm. 11.25 cm. 10.25 cm.

Newly moulted

TABLE 1 (continued)

Date	Depth, gear, and no. of specimens collected	Percentage of total catch	Epizoic species	Attachment site and abundance	Carapace length	Remarks
23-9-1960	66 metres, Trawl net, 5	20.00	{ <i>Balanus amphitrite</i> <i>Octolasmis warwickii</i> (Gray) <i>Balanus amphitrite</i>	{ Carapace (three) Carapace (two) Carapace (four) First tergum (one) Carapace (six)	10.0 cm. 10.5 cm. 10.5 cm. 9.75 cm. 10.0 cm.	Plate, Fig. 2
18-11-1960	4 metres, Hoop net, 1	2.00	<i>Acanthodesia</i> (Encrusting bryozoan)	Carapace (375 sq. mm.)	11.0 cm.	
16-2-1961	40 metres, Trawl net, 1	2.04	<i>Balanus amphitrite</i>	Carapace (four)	10.0 cm.	
4-4-1961	50 metres, Trawl net, 2	5.00	<i>Balanus amphitrite</i>	{ Carapace (three) Carapace (five)	8.75 cm. 10.5 cm.	
11-4-1961	44 metres, Trawl net, 2	7.14	{ <i>Balanus</i> sp. <i>Balanus amphitrite</i>	Sternum (one young) Carapace (three)	10.0 cm. 10.75 cm.	
23-4-1961	54 metres, Trawl net, 5	8.07	{ <i>Balanus amphitrite</i> <i>Balanophyllia</i> sp. (Coral), & <i>Balanus amphitrite</i>	{ Carapace (three) Carapace (two) Second tergum (one) Carapace (one) Carapace (one each) Carapace (one each)	12.25 cm. 11.0 cm. 10.5 cm. 10.5 cm. 11.25 cm.	
17-5-1961	6 metres, Hoop net, 1	2.50	<i>Balanus amphitrite</i>	Sternum (three)	11.0 cm.	Plate, Fig. 1
26-6-1961	40 metres, Trawl net, 4	13.95	{ <i>Balanus amphitrite</i> <i>Chelonibia patula</i> <i>Balanus</i> sp.	{ Carapace (three) Uropod (two) Carapace (four) Carapace (one) Carapace (one) Carapace (two, young)	10.0 cm. 9.5 cm. 10.75 cm. 10.75 cm. 11.75 cm.	
	64 metres, Trawl net, 2	13.95	<i>Balanus amphitrite</i>	Carapace (two)	10.75 cm.	
25-9-1961	4-6 metres, Hoop net, 1	3.03	<i>Ostrea</i> (<i>Crassostrea</i>) <i>cucullata</i>	Carapace (five young)	10.5 cm.	
10-10-1961	48 metres, Trawl net, 3	11.11	{ <i>Balanus amphitrite</i> <i>Octolasmis tridens</i> (Aurivillius) <i>Balanus amphitrite</i>	{ Carapace (three) Carapace (three) Carapace (five very small) Carapace (one)	9.25 cm. 11.0 cm. 9.75 cm.	Newly moulted
1-2-1962	60 metres, Trawl net, 3	7.50	<i>Balanus amphitrite</i>	{ Carapace (four) Carapace (one) Carapace (two)	10.0 cm. 11.25 cm. 10.25 cm.	

only occasionally, two instances could be recorded, one having three young *Tubularia* colonies and the other having nine young specimens of goose-barnacle, *Octolasmis tridens* (Aurivillius). Both the squat-lobsters were adult females and had the epizoa on the carapace.

The recorded epizoic incrustations of *P. polyphagus* are summarised in Table I.

THE EPIZOIC ASSOCIATES

The percentage occurrences of various epizoa of *P. polyphagus* were found to be as follows:

TABLE II
PERCENTAGE OF OCCURRENCE OF EPIZOA

Species		Percentage
(1) <i>Balanus amphitrite</i> (Darwin)	80.00%
(2) <i>Chelonibia patula</i> (Ranzani)	2.22%
(3) <i>Octolasmis warwickii</i> (Gray)	2.22%
(4) <i>Octolasmis tridens</i> (Aurivillius)	2.22%
(5) <i>Serpulid</i> (Tube-building annelid)	4.44%
(6) <i>Ostrea</i> (<i>Crassostrea</i>) <i>cucullata</i> Born.	4.44%
(7) <i>Balnophyllia</i> sp. (coral)	2.22%
(8) <i>Acanthodesia</i> sp. (bryozoan)	2.22%

Sessile Barnacles. The dominant balanid *Balanus amphitrite* (Darwin), constituting as much as 80% of the total epizoa records, appears to be the commonest incrusting associate of the Bombay spiny lobster (Plate, fig. 1). Herrick (1895, p. 122) in his classic monograph on the American lobster aptly remarks: 'Whenever the lobster is confined in inclosures or compelled for any reason to lead a sluggish life, the common barnacle fixes itself to the arched carapace and begins to secrete its tent-like covering as securely as it might upon a stone.' It will be clear from columns 4-5 of Table I that balanids alone are capable of settling on any part of the *P. polyphagus* shell. In most of the instances only a single barnacle population had settled on the shell while a very few had two different barnacle populations growing on the body.

The subspecies of *Balanus amphitrite* commonly epizoic on *P. polyphagus* were found to be *B. amphitrite variegatus* (Darwin) and *B. amphitrite hawaiiensis* (Broch). A single specimen of the latter subspecies has been recorded by Nilsson-Cantell (1938) on the crab *Schizophrys aspera* from the Persian Gulf. *Balanus amaryllis* (Darwin) recorded by him as epizoic on *Palinurus* (?) sp. from the Balasore Bay of Orissa, however, is not yet known from Bombay.

The other balanomorphid found epizoic on the Bombay lobster was the turtle barnacle *Chelonibia patula* (Ranzani). In this particular instance the lobster also had two much younger *Balanus* specimens on the carapace. *C. patula* in epizoic state on a decapod has also been recorded earlier by Nilsson-Cantell (1938) and Daniel (1956) on the crab *Scylla serrata* (Forsk.) collected from Lake Pulicat, Madras.

Pedunculate Barnacles. Two species of *Octolasmis*, viz. *O. tridens* (Aurivillius) and *O. warwickii* (Gray) were found to be epizoic on *P. polyphagus*. This is incidentally a new record for both these pedunculate species from Bombay.

As mentioned earlier *O. tridens* was found epizoic on *Thenus orientalis* also. Similar instances of *Octolasmis tridens* epizoic on *T. orientalis* have been reported by Annandale (1909) from Orissa coast and by Nilsson-Cantell (1938) from Singapore. Annandale has mentioned *O. warwickii*, besides, as occurring on *T. orientalis* from Orissa and Hughli river mouth.

A noteworthy record of heteralepadid cirriped settling on a panulirid lobster is reported earlier by Barnard (1924, p. 62) for *Paralepas palinuri* (Barnard) from shallow waters of S. Africa. The subspecies *urae* (Newman) of *Paralepas palinuri* has been more recently reported by Newman (1960, p. 112) from the maxilliped of *Panulirus penicillatus* (Oliv.).

The other earlier records of lepadomorphids settled on carapace, limbs, mouthparts, and gill-chamber entrance of spiny lobsters are given by Annandale (1909) for *Octolasmis warwickii* from the Orissa coast, *O. cor* (Aurivillius) from the Indian Ocean, *O. angulata* (Aurivillius) from Bombay and Orissa coast, *O. sinuata* (Aurivillius) from Red Sea/Persian Gulf, and *Poecilasma minutum* (Gruvel) from 7° 15' 0" N., 77° 46' 0" E. (143 fathoms); by Nilsson-Cantell (1938) for *Trilasmis amygdalum* (Aurivillius); and by Daniel (1956) for *Trilasmis minuta* (Gruvel), *Octolasmis lowei* (Darwin), *O. angulata* (Aurivillius), *O. tridens* (Aurivillius), and *O. warwickii* (Gray). *Poecilasma excavatum* (= *Trilasmis excavatum*) (Hoek) and an *Octolasmis* sp.

have also been more recently reported epizoid on the spiny lobster *Puerulus sewelli* Ramadan by Dinamani & Kurian (1961).

The spiny lobster 'host' mentioned by Annandale in all his records is '*Panulirus* sp.'. In case of *Poecilasma minutum*, however, he mentions it specifically as *Panulirus angulatus* (Alcock, 1901) which is identical with *Puerulus sewelli* Ramadan (Holthuis, 1946, p. 110). The host mentioned by both Nilsson-Cantell and Daniel on the other hand is '*Palinurus*' sp. The identification of the host genus as '*Palinurus*' in the Indian records of both Nilsson-Cantell and Daniel is apparently an error for *Panulirus*. The family Palinuridae is predominantly represented in the Indian waters by the genus *Panulirus*, while *Palinurus* is as yet known only from two uncertain records.

Bivalves. *Ostrea* (*Crassostrea*) *cucullata* Born. was found to be the only pelecypod associate of *P. polyphagus*. Both the instances of oyster spat settlement (Table I) are from Uran creek. Lobsters from deeper waters were always free from any bivalve settlements.

Tube-building Annelids. Only in two instances *P. polyphagus* from trawl catches had dead tubes of serpulids on its carapace and thoracic sternum. Much heavier incrustations of serpulids were present on many of the lobster moults washed ashore.

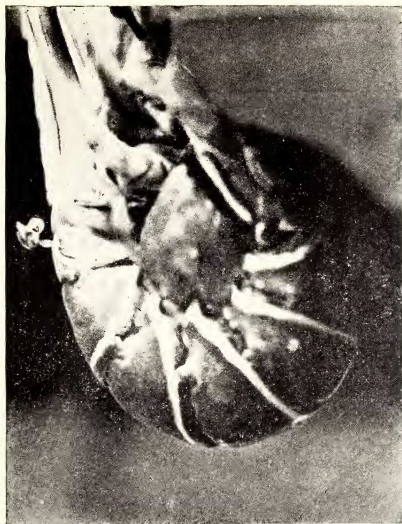
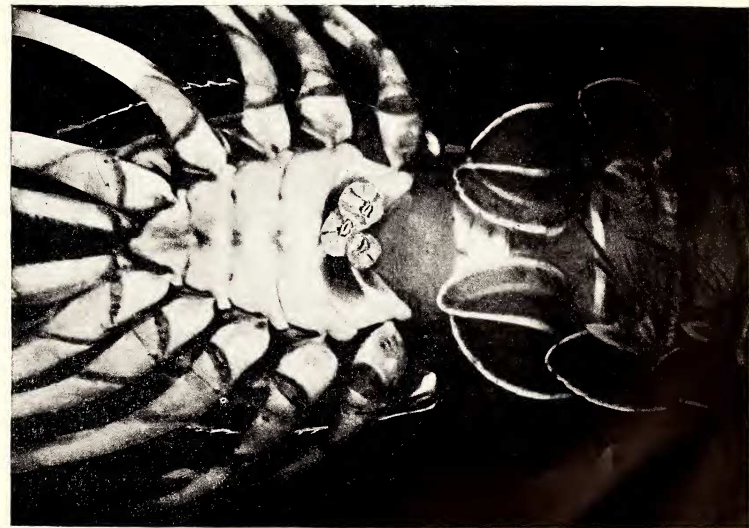
Coelenterates. Skeleton of the solitary coral *Balanophyllia* was found anchored on the carapace of a berried female *P. polyphagus* from deeper waters. The age of this coral, estimated to be around a year, indicated that this female had not moulted for that period. This lobster also had a *Balanus amphitrite* on the carapace.

Bryozoa. The incrusting bryozoan *Acanthodesia* was found on *P. polyphagus* once only. On the contrary, however, Dexter (1955) in the case of *Homarus americanus* registers bryozoa as the chief fouling organisms.

RELATION BETWEEN THE SPINY LOBSTER AND THE EPIZOA

In case of the American lobster *Homarus americanus* (M. Edw.) Herrick (1895, p. 122) remarks: '. . . . the lobster is encumbered with a great variety of messmates which attach themselves to the

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(Left). Balanids on thoracic sternum of *P. polyphagus* ;
(Above). Pedunculate Cirriped *O. warwickii* on *P. polyphagus*.

(Photos : Author)

